

Date: Thursday, 25/09/2008 10:29:29 AM  
 User: Melanie Fauteux

## Process Sheet

<b>Customer</b> : CU-DAR001 Dart Helicopters Services	<b>Drawing Name</b> : 212/205 HIGH FED X-TUBE ASSEMBLY
<b>Job Number</b> : 42283	
<b>Estimate Number</b> : 10254	
<b>P.O. Number</b> :	<b>Part Number</b> : D212664101
<b>This Issue</b> : 25/09/2008 <b>S.O. No.</b> :	<b>Drawing Number</b> : D212-664-141 REV C
<b>Prsht Rev.</b> : NC	<b>Project Number</b> : N/A
<b>First Issue</b> : / / <b>Type</b> : CROSSTUBES	<b>Drawing Revision</b> : C
<b>Previous Run</b> : 42282	<b>Material</b> :
<b>Written By</b> :	<b>Due Date</b> : 02/10/2008 <b>Qty:</b> 1 <b>Um:</b> Each
<b>Checked &amp; Approved By</b> : MF 08-09-25	
<b>Comment</b> : Est Rev:E 04.02.16 Reformat KJ/DS	
Est Rev:F 06-03-29 Remove Coments on Pick List JLM	
Est Rev:G 07-04-30 As per Rev C JLM	

## Additional Product

Job Number:



Seq. #:	Machine Or Operation:	Description :
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1.0	DC	DOCUMENT CONTROL
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JLD 08.10.01

**Comment:** DOCUMENT CONTROL

Photocopy bluefile and create labels as per PPP D212-664-101 CHG003

2.0	PACKAGING 1	PACKAGING RESOURCE #1
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**Comment:** PACKAGING RESOURCE #1

3.0	D212664101TRN	Crosstube Turning Detail
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**Comment:** Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

CROSSTUBE TURNING DETAIL

batch B42127

DP 8-9-25

4.0	BENDING	BENDING MACHINE - SKIDTUBES
-----	---------	-----------------------------

**Comment:** BENDING MACHINE

Bend tube as per Dwg D212-664-141 using CNC bender program 212-fw and Folio FT015

DP 8-9-25

5.0	QC15	DIMENSIONAL CHECK OF X-TUBES
-----	------	------------------------------

**Comment:** DIMENSIONAL CHECK OF X-TUBES

08-09-25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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Job Number: 42283

Part Number: D212664101

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

CROSSTUBES

CROSSTUBES RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Drill pilot holes in tube as per Dwg D212-664-141 using drill Jig DT8548 & DT8549

2-Ream hole to finish size in tube as per Dwg D212-664-141 using drill Jig DT8548 & DT8549. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D212-664-141

4-Scribe part # and batch # using vibrating stylus as per Dwg D212-664-141

RT  
08-09-26

AWM 5-9-29

RT 08-09-26

7.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



AWM 5-9-29



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1 within 24 hours of bending and drilling

8.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

08/09/29 (2)

9.0

OUTSIDE SERV.11

OUTSIDE SERVICE -CROSSTUBES



Comment: Sub-Contracting OUTSIDE SERVICES

Liquid Penetrant Inspection as per QSI 038

Issue P/O: 7301

LPI as per ASTM 1417 Level 2

Attach copy of NDT results to work order

08/10/02 (1)

10.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Inspect for transit damage Ensure copy of NDT results attached to work order.

08/10/02 (1)

11.0

QC5

INSPECT WORK TO CURRENT STEP



08/10/02



(1)

Comment: Inspect for damage & ensure results are as per Dwg D212-664-141

W/O:		WORK ORDER CHANGES					
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Part Number: D212664101

Job Number:



Seq. #:

Machine Or Operation:

Description :

12.0

SPRAY PAINTING

SPRAY PAINTING



Comment: SPRAY PAINTING

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per QSI 005 4.2

ml 08 10 08

13.0

QC14

INSPECT SPRAY PAINT



Comment: Inspect Spray Paint

Then, Wrap in plastic bag to protect from scratches

08 10 03 ①

14.0

D28931

2.75 Support



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

Pick:

Qty Part number Description Batch

2 D28931-1

Support 40781

ml 08 10 06

15.0

D3595063450

RUBBER CUSHION



Comment: Qty.: 4.2000 Each(s)/Unit Total : 4.2000 Each(s)

Rubber Cushion (per sq ft)

.630" X 4.5" 4PCS

Batch: 40221

ml 08 10 06

16.0

MS2192025

Clamp(per MIL-DTL-8783C)



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Pick:

Qty Part number Description Batch

4 MS21920-25

Clamp 108976

ml 08 10 06

17.0

CROSSTUBES

CROSSTUBES RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe

2-Install supports with magnobond as per QSI 015 Adhere for for 12 Hrs

A/R 6398 Magnobond Batch: 108966

ml 08 10 06 ①

W/O:		WORK ORDER CHANGES					
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Job Number: 42283

Part Number: D212664101

Job Number:



Seq. #:

Machine Or Operation:

Description :

Expiry Date: 10/2009  
Time: 9:50am

ml 08 10 06 ①

3-Install clamps as per Dwg D212-664-141. Torque clamps to 80-100 in lb.

ml 08 10 07 ①

18.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

06.10.07 ①

19.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Pick Packing Kit

20.0

D34281

Placard



Comment: Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

PLACARD

Batch: 41552

JS 08/10/08 ①

21.0

AN635A

BOLT



Comment: Qty.: 4.0000 Each(s)/Unit Total: 4.0000 Each(s)

Bolt

Batch: M109282

JS 08/10/08 ②

22.0

AN636A

Bolt



Comment: Qty.: 4.0000 Each(s)/Unit Total: 4.0000 Each(s)

Bolt

Batch: M108765

JS 08/10/08 ③

23.0

AN960JD616

Washer



Comment: Qty.: 18.0000 Each(s)/Unit Total: 18.0000 Each(s)

Washer

Batch: M108521

JS 08/10/08 ④

24.0

MS21042L6

Nut



Comment: Qty.: 6.0000 Each(s)/Unit Total: 6.0000 Each(s)

Nut

Batch: M108183

JS 08/10/08 ⑤

W/O:		WORK ORDER CHANGES					
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Job Number:



Seq. #:

Machine Or Operation:

Description :

25.0

QC4

INSPECT 100% KITS FOR COMPLETENESS



*Job 10-09*

Comment: INSPECT 100% KITS FOR COMPLETENESS

26.0

PACKAGING 1

PACKAGING RESOURCE #1



*Rev D*

*FX*

Comment: HAND FINISHING RESOURCE #1

Identify and pack for shipping as per PPP D212-664-101

*5/10/8*

*SD*

27.0

QC21

FINAL INSPECTION/W/O RELEASE



*08/10/09*

Comment: FINAL INSPECTION/W/O RELEASE

Job Completion



*U 8-10-08*

W/O:		WORK ORDER CHANGES					
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DESIGN <b>PH</b>	DRAWN BY <b>PH</b>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <b>92</b>	APPROVED <b>[Signature]</b>	DRAWING NO. D212-664-141	REV. C SHEET 1 OF 3
DATE 07.03.08		TITLE XTUBE ASS'Y (205/212/412 HI FWD) NTS	
A	00.12.12	NEW ISSUE	
B	05.02.04	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	
C	07.03.08	REMOVE -851 ABRASION STRIP; ADD MAGNOBOND 6398, CUSHION, REVERSE CLAMPS	

RELEASED

07.04.24

Qty	Part Number	Description
X	D212-664-141	CROSSTUBE ASSEMBLY (205/212/412 HIGH FWD)
1	D6005-128	CROSSTUBE
2	D2893-1	SUPPORT
4	D3595-063-450	RUBBER CUSHION
4	MS21920-25	CLAMP (OR MS21920-26)
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

#### GENERAL NOTES:

- 1) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 2) MATERIAL: MANUFACTURED FROM D6005-128  
FINISHED LENGTH =  $126.51 \pm 0.020$
- 3) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 4) PART IS SYMMETRIC ABOUT CENTERLINE.
- 5) RUN-OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- 6) BEND PROGRESSIVELY WITH A MINIMUM OF 3 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 7) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 8) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- 9) INSTALL D2893-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 10) INSTALL MS21920-25 CLAMPS (OR -26) WITH D3595-063-450 RUBBER CUSHIONS TO SECURE THE D2893-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT
- 11) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 12) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

REFERENCE ONLY

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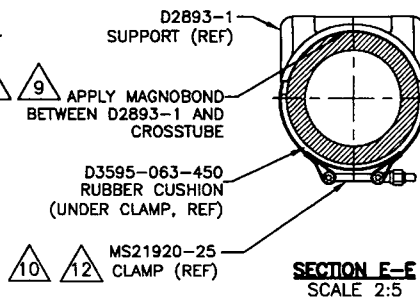
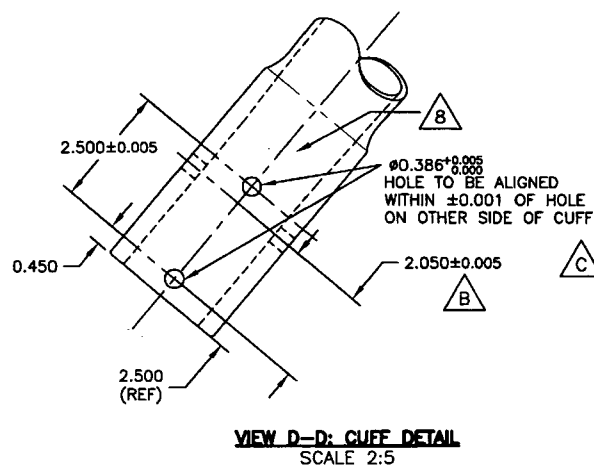
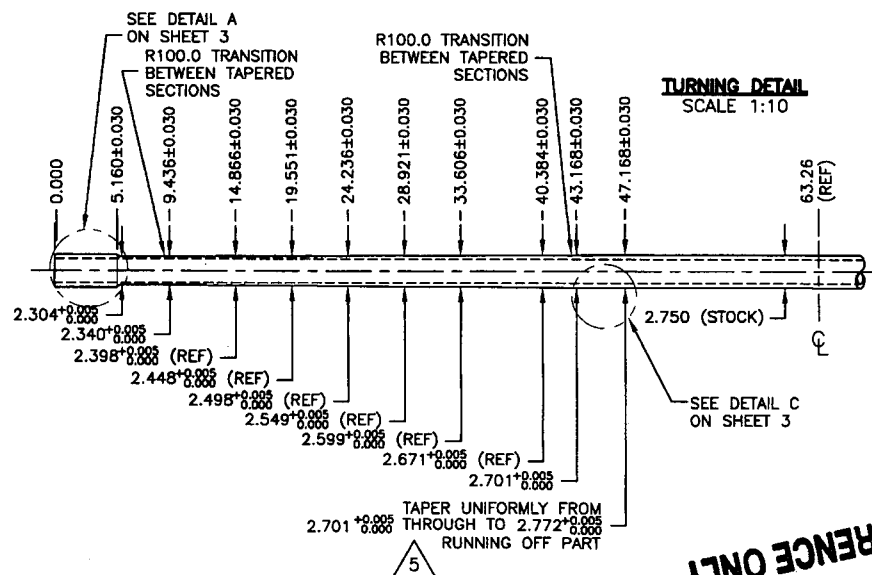
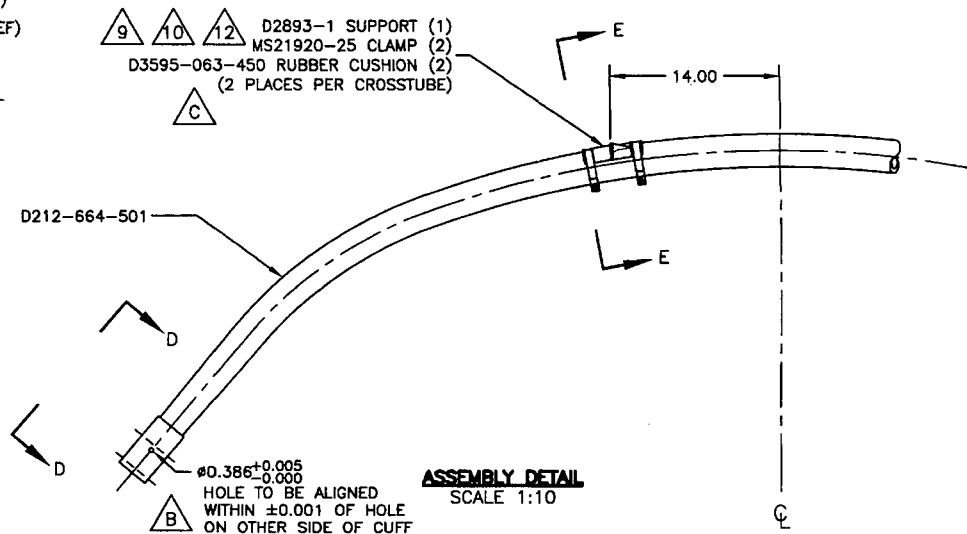
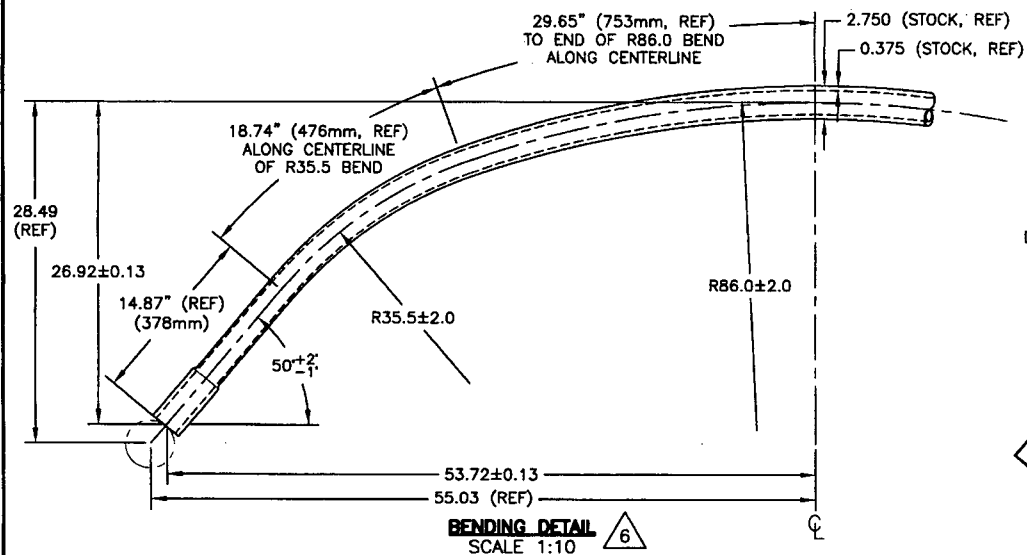
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RELEASED

07.04.24

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DESIGN	PH	DRAWN BY	PH	<b>DART</b>	DART AEROSPACE LTD. MARKHAM, ONTARIO, CANADA
CHECKED	GP	APPROVED	4	DRAWING NO.	REV. C
				D212-664-141	SHEET 2 OF 3
DATE	07.03.08	TITLE			SCALE
		XTUBE ASS'Y (205/212/412 HI FWD)			1:10

W/O:		WORK ORDER CHANGES					
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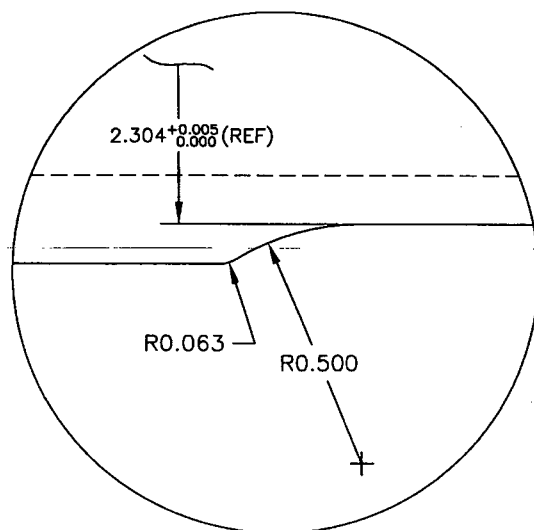
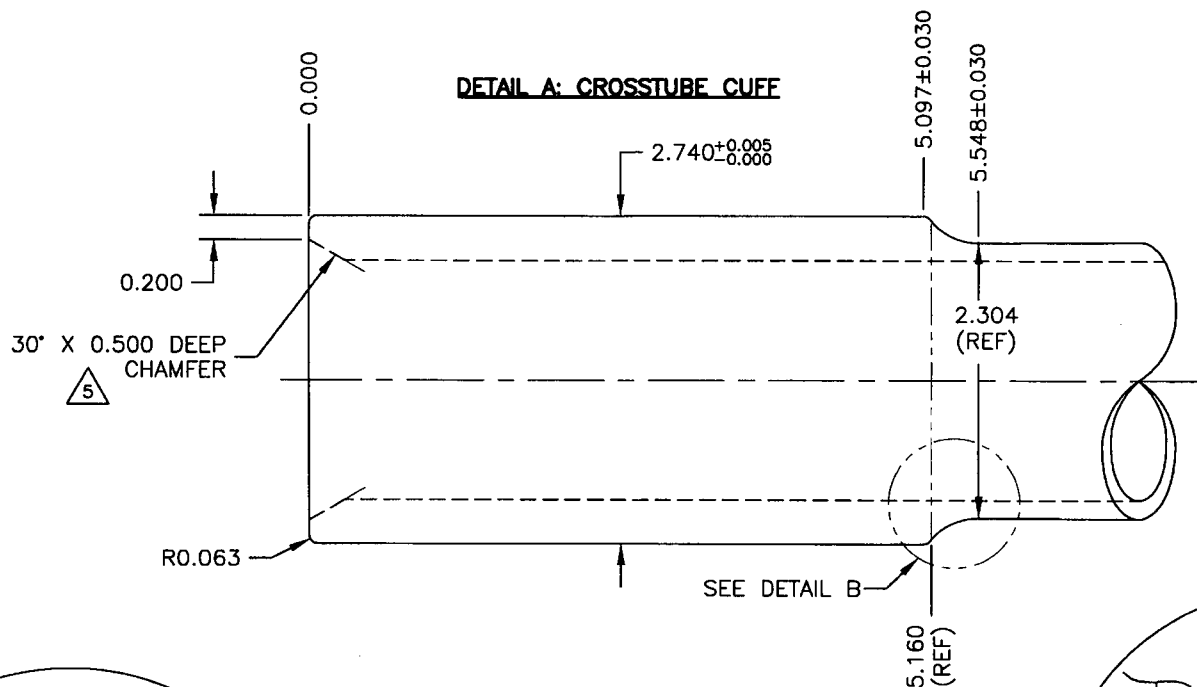
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**RELEASED**  
97.04.24  
PER CLN 887

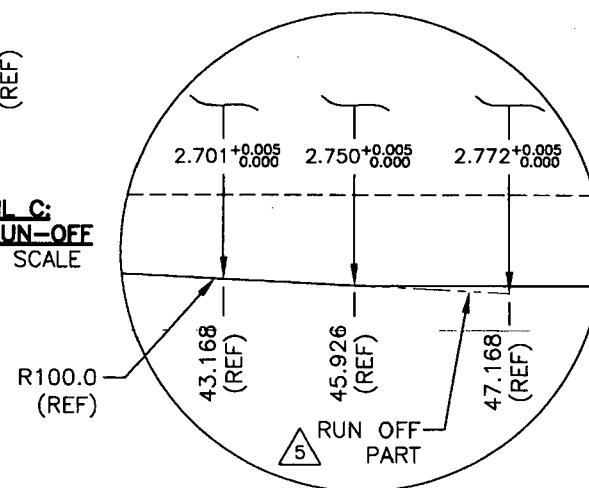
**DETAIL A: CROSSTUBE CUFF**



**DETAIL B: CUFF  
TRANSITION**  
SCALE 4:1

**REFERENCE ONLY**

**DETAIL C:  
TAPER RUN-OFF**  
NOT TO SCALE



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DESIGN PH	DRAWN BY PH	<b>DART</b>	DART AEROSPACE LTD. HARRISBURG, ONTARIO, CANADA
CHECKED J	APPROVED J	DRAWING NO. 0212-664-141	REV. C SHEET 3 OF 3
DATE 07.03.08	TITLE XTUBE ASS'Y (205/212/412 HI FWD)	SCALE 1:1	

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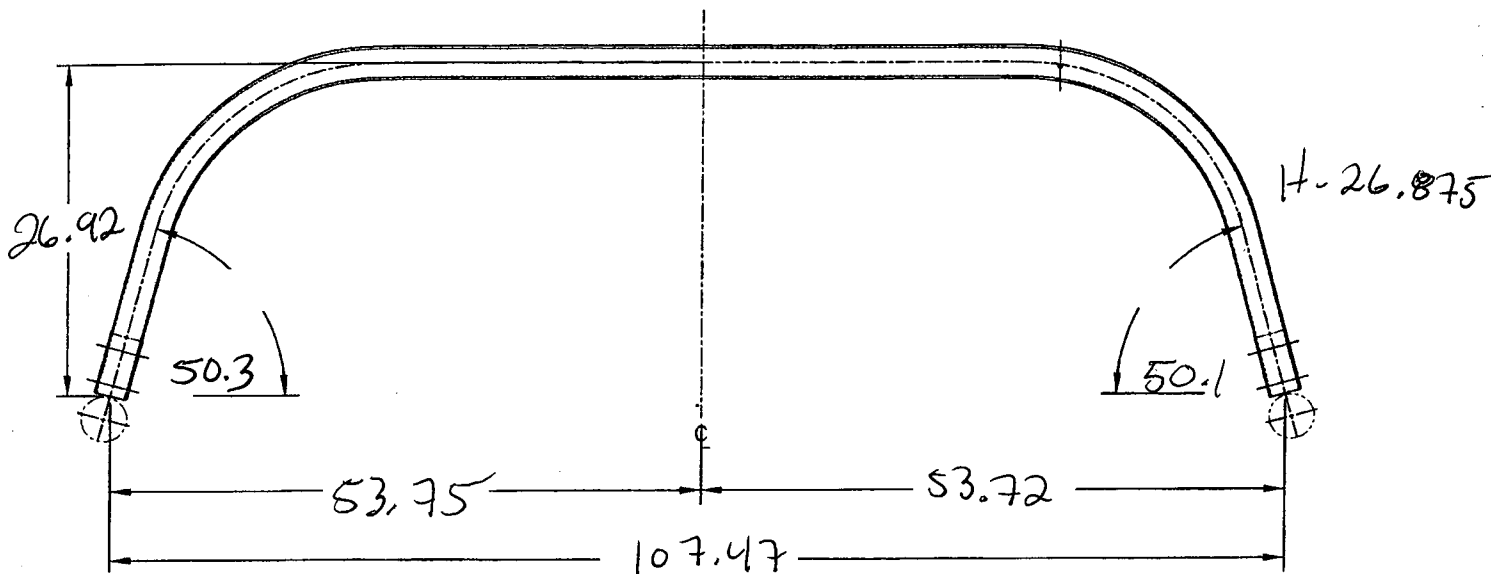
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<b>DART AEROSPACE LTD</b>	<b>Work Order:</b>	42283
<b>Description:</b> Crosstube High Fwd (205/212/412)	<b>Part Number:</b>	D212-664-101
<b>Inspection Dwg:</b> D212-664-141 <b>Rev:</b> C		<b>Page 1 of 1</b>

Required Dimension	Min	Max
Height	26.79	27.05
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.7



Comments

QC15 Inspection	<i>[Signature]</i>
Date	

08-09-25

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	<i>[Signature]</i>
B	07.05.31	Dimensions updated per Dwg Rev C	KJ/JM	

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# NONDESTRUCTIVE TESTING REPORT

N- 10406

PAGE 1 OF 1

CLIENT DART AEROSPACE DATE 09/22/2008 TIME ☒ AM ☐ PM  
ATTENTION LINDA LACELLE ACUREN JOB NO. 188-08-1533  
ADDRESS 1270 ABERDEEN ST. PO/NO. SHOP - SAME ADDRESS  
KAWKES BULY CNT. WORK LOCATION  
PROJECT 8 LPI. CROSS TUBES ACCEPTANCE STD. ASTM 1417/051-038 REV./DATE  
ITEM(S) EXAMINED SIX - CROSS TUBES.  
JOB # PMT - 41393, 41394, 42063, 42064, 42282, 42283.

JOB DESCRIPTION  
PART NO. MATERIAL ALUMINUM THICKNESS  
SCOPE WET FLUORESCENT LIQUID PENETRANT INSPECTION CARRIED OUT ON 100% EXTERNAL SURFACE - \* NOTE: INDICATIONS, PC ON CHATTEL/D4.590" UP FROM THE END OF THE CUFF. 2" RADIUS ON BOTH ENDS/41394.

LIQUID PENETRANT TESTING PROCEDURE NO. LT-XXXX REV./DATE TECHNIQUE NO. LT-XXXX-XXX REV./DATE  
METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
FAMILY BRAND MAGNAFLUX BLACK LIGHT S/N 8071 ☐ OUTPUT > 1000  $\mu$ W/cm<sup>2</sup> ☐ AMBIENT < 2 fc  
PENETRANT 2L07 MINIMUM DWELL TIME 45 MIN. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE  
PENETRANT REMOVER H2O MINIMUM DRY TIME >10 MIN. OTHER CAL FEB 12-08  
DEVELOPER MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N CAL DUE DATE  
DEVELOPER TYPE ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY  
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < -4°C/20°F ☐ -4°C/20°F TO 10°C/50°F ☐ 10°C/50°F TO 52°C/125°F ☐ > 52°C/125°F

MAGNETIC PARTICLE TESTING PROCEDURE NO. MT-XXXX REV./DATE TECHNIQUE NO. MT-XXXX-XXX REV./DATE  
METHOD ☐ DRY ☐ WET ☐ FLUORESCENT ☐ NON FLUORESCENT ☐ YOKE ☐ COIL ☐ HEAD ☐ CONDUCTOR BAR  
PARTICLE BRAND PRODUCT NO. CURRENT ☐ AC ☐ DC EFF. CURRENT AMPS:  
PARTICLE COLOUR ☐ GREY ☐ RED ☐ BLACK ☐ OTHER MT INSTRUMENT S/N CAL DUE  
SUSPENSION ☐ WATER ☐ OIL ☐ NOT APPLICABLE BLACK LIGHT S/N ☐ OUTPUT > 1000  $\mu$ W/cm<sup>2</sup> ☐ AMBIENT < 2 fc  
CONTRAST PAINT PRODUCT NO. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100fc @ SURFACE  
MAG. TIME SECONDS DEMAG. REQUIRED? ☐ Yes ☐ No LIGHT METER S/N CAL DUE  
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☐ CLEAN BARE METAL ☐ COATED  
THE TECHNIQUE HAS BEEN DEMONSTRATED OVER A COATED SURFACE? ☐ YES ☐ N/A THICKNESS: TYPE OF COATING:  
SURFACE TEMPERATURE ☐ < 57°C/135°F ☐ 57°C/135°F TO 316°C/600°F ☐ > 316°C/600°F

ULTRASONIC TESTING PROCEDURE NO. UT-XXXX REV./DATE TECHNIQUE NO. UT-XXXX-XXX REV./DATE  
METHOD ☐ THICKNESS ☐ FLAW DETECTION ☐ CONTACT ☐ IMMERSION  
INSTRUMENT MODEL S/N CAL. DUE DATE  
CAL. BLOCK S/N CABLE - TYPE Coaxial - to LENGTH  
CAL. BLOCK S/N COUPLANT  
CAL. BLOCK S/N SPECIAL EQUIP.

INFORMATION - TRANSDUCERS & CALIBRATIONS -

TEST ANGLE	PROBE TYPE		MAKE	FREQ.	SER. NO.	PROBE DIA.	TRANSFER VALUE	TEST FROM FACE	REFERENCE REFLECTOR	REFERENCE		SCAN SENSITIVITY	RANGE
	SINGLE	DUAL								dB	% FSH		
1 <input type="checkbox"/> 0°	<input type="checkbox"/>	<input type="checkbox"/>											
2 <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>											
3 <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>											

TEST SURFACE  
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☐ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < 0°C/32°F ☐ 0°C/32°F TO 120°C/250°F ☐ 120°C/250°F TO 260°C/500°F ☐ > 260°C/500°F

Scope of Services  
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, maintenance, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.  
Standard of Care  
In performing the services provided, Acuren Group Inc. uses the degree of care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

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